Metering Device for Flowable Products

The invention relates to a metering device for flowable products, in particular, dairy products, according to the preamble of claim 1.

In known metering devices for liquid products (EP 0 286 785 A2), the product is supplied through the central valve cylinder into the metering chamber and is subsequently dispensed by means of the metering piston via a gap area that constitutes at the same time the supply opening. This supply opening has a constant size so that only products with a matching consistency can be used.

The invention concerns the problem of providing a metering device for flowable products that enables processing of products of all conventional kinds, in particular, also of products containing large solid components, with minimal technical expenditure.

The invention solves this problem with a metering device having the features of claim 1. With regard to important further embodiments, reference is being had to claims 2 to 7.

The metering device according to the invention enables a product supply from the exterior into the metering chamber. In this connection, the metering cylinder is guided to be axially movable within the outer supply cylinder so that, for sucking in the product into the inner metering chamber, a variable size of the gap area that forms the supply opening is possible and, accordingly, products of different consistency and containing coarse components, for example, fruit, can be taken in for metering without any disadvantageous effects.

With regard to further details and advantages of the invention, reference is being had to the following description and the drawings in which the metering device

according to the invention will be explained with the aid of an embodiment. The drawings show in:

Fig. 1 a schematic illustration of a filling unit in a side view comprising several metering devices that are arranged in a row and each have a receptacle;

Fig. 2 an enlarged detail view of two metering devices in different movement phases during filling of the receptacle;

Fig. 3 an enlarged detail view of two metering devices in different phases during filling of their metering chamber;

Fig. 4 an enlarged detailed view of the metering device during cleaning;

Fig. 5 and

Fig. 6 each a detail view of a metering device provided with a movable mouthpiece according to a second embodiment.

In Fig. 1, a dispensing device for dairy products, identified in its entirety by numeral 1, is illustrated that comprises a product reservoir 3 closed by a wall 2. In this container 3, metering devices 4 are provided in a row; they are differentiated in the following according to their different operating positions only by the identifiers 4.1, 4.2, 4.3, 4.4, and 4.5 and they each have the same configuration. These metering devices 4 operating according to the principle of a piston metering device are provided for filling cups 5, respectively, wherein the cups and the parts of the filling device 1 can also be provided as a component of a molding, filling, and sealing device (not illustrated in detail).

The metering device 4 illustrated in more detail in Figs. 2 through 4 is provided with a metering cylinder 6, a valve cylinder 7 arranged coaxially therein, and a ring-

shaped metering piston 8 that is movable within an annular chamber 9 extending between the metering cylinder 6 and the valve cylinder 7 in such a way that the metering piston 8, in accordance with the cycle control of the filling device 1, assumes an upper intake position and a lower dispensing position and, accordingly, conveys a product quantity, respectively, out of the product reservoir 3.

The metering piston 8 divides the annular chamber 9 into an upper part connected in a passage area 10 to the product reservoir 3 and a lower part forming the metering chamber 11 for the product. The metering chamber 11 in the metering cylinder 6 is closed at the bottom side by a mouthpiece 13 with the exception of a coaxial cylindrical dispensing opening 12. Moreover, a central valve piston 15 is provided that is axially movable between a lower closing position (metering device 4.2) engaging the dispensing opening 12 of the mouthpiece 13 and an upper release position (metering device 4.3). This configuration of the metering device 4 that is referred to as a piston metering device is disclosed in principle in EP 0 286 785 A2.

In the metering device 4 according to the present invention, the valve cylinder 7 and the valve piston 15 are combined into a central module so that the constructive expenditure for manufacturing the respective modules can be significantly reduced by simpler individual parts, in particular, turned parts.

The assembly comprised of the metering cylinder 6, the metering piston 8, and the piston-cylinder unit 7, 15, provided especially as a monolithic part, is arranged coaxially to an outer supply cylinder 16 connected with its top to the product reservoir 3 and extending between a bottom plate 17 of the product reservoir 3 and a securing plate 18 of the filling device 1 provided with the mouthpiece 13.

By providing the supply cylinder 16 connected near the passage area 10 with its top to the bottom plate 17, a supply chamber 20 is created that surrounds as an annular

chamber the metering cylinder 6. In the area of this supply chamber 20, the metering cylinder 6 is moveable according to the direction of arrow D from a lower closing position (according to metering device 4.1, Fig. 2) into an upper opening position (metering device 4.3, Fig. 3). In the lower closing position of the metering device 4.1, the end face of the metering cylinder 6 engages the mouthpiece 13 so that the inner metering chamber 11 is closed relative to the surrounding annular supply chamber 20. In the upper opening position of the metering device 4.3 (Fig. 3), the metering chamber 11 communicates with the surrounding annular supply chamber 20 within the supply cylinder 16 via a supply opening 21, wherein this supply opening 21 extends between the end face of the metering cylinder 6 and the mouthpiece 13.

Based on the metering device 4.1 illustrating the dispensing phase, the function of the metering devices operated especially synchronized within the row arrangement will be explained in the following in more detail. The metering device 4.1 shows the valve piston 15 in its upper opening position in which the dispensing opening 12 of the mouthpiece 13 is open relative to the metering chamber 11. At the same time, the metering cylinder 6 is positioned in its lower contact position and rests against the mouthpiece 13 so that the connection between the supply chamber 20 and the metering chamber 11 is interrupted. In this phase of the filling process, the metering piston 8 is moved by an advancing movement illustrated by arrow A to such an extent that the product contained in the metering chamber 11 is moved in a dispensing direction indicated by several arrows P and is conveyed through the dispensing opening 12 via the mouthpiece 13 into the cup 5. The metering piston 8 reaches the lower push-out position illustrated in metering device 4.2 in which a product quantity that has been precalculated based on the metering chamber 11 and the stroke of the metering piston 8 is dispensed into the cup 5. In this operating phase of the metering device 4.2 that is completed by the dispensing action, the valve piston 15 can become active in that it is moved in the direction of arrow K so that the dispensing opening 12 in the area of the mouthpiece 13 is closed.

The subsequent movement phase is illustrated in Fig. 3 wherein the valve piston 15 now remaining in the closing position in the mouthpiece 13 is illustrated clearly. In the next cycle phase, the metering cylinder 6, by introducing a movement according to the direction of arrow D, as well as the metering piston 8, by introducing a movement according to arrow B, are moved simultaneously or sequentially upwardly. In this way, the movement according to arrow D first opens the gap-shaped area of the supply opening 21 in order to repeat a product supply.

This new product supply into the metering chamber 11 is illustrated in more detail with the aid of the metering device 4.4 in Fig. 3, wherein, for taking in the product, a further movement of the metering piston 8 in the direction of arrow B' is provided and the product that has been sucked in from the product reservoir 3 passes the annular passage area 10, reaches the supply chamber 20, and, by moving through the latter, fills the metering chamber 11 via the supply opening 21. In the upper part of the annular chamber 9, the product that also surrounds the metering piston 8 at the backside is pushed back via the openings 14, 14' out of the annular chamber 9 into the container 3.

For the intake process according to the metering device 4.4, the movement of the metering cylinder 6 (arrow D) according to the present invention is advantageous because its distance S in the area of the annular supply opening 21 can be matched with minimal expenditure to the consistency of the product being processed. By a variation of the stroke according to the movement direction D, the gap size S can be kept small, for example, for liquid products; for pasty products, it can be enlarged accordingly. Advantageously, this adjusting possibility is useful in particular when products with solid components, for example yogurt containing fruit, is to be dispensed. In this application, the gap size S can be matched to the size of the fruit so that accidental crushing of the fruit or jamming in the gap area can be reliably prevented.

After the metering piston 8 has reached its upper end position that is determined in accordance with the metering volume of the metering chamber 11 upon movement according to the direction of arrow B', in accordance with a substantially reverse sequence of the above described movement sequences initially the metering cylinder 6 is lowered opposite to its lifting movement D and, in this way, the connection between supply chamber 20 and metering chamber 11 is interrupted, wherein the terminal edge of the metering cylinder 6 can comprise a profiled configuration in the form of a cutting edge that cooperates with the mouthpiece 13. In the contact position of the metering cylinder 6, the valve piston 15 can be lifted opposite to its lowering movement K so that the dispensing opening 12 in the area of the mouthpiece 13 can be released for the dispensing phase illustrated with the aid of the metering device 4.1 (Fig. 2) and the filling process to be performed can be realized by lowering the metering piston 8.

In Fig. 4, metering device 4.5 illustrates schematically a movement phase of the assembly required for cleaning the dispensing device 1 after a long period of use. For this cleaning situation, it is provided that the valve piston 15 and the metering cylinder 6 are axially movable into an upper service position wherein at the same time the metering piston 8 is moved into a lower service position. For providing a free accessibility of the metering chamber 11 in this service position, the valve piston 15 is retracted completely into the metering cylinder 6 so that these two parts are positioned at a spacing above the metering piston 8 and, in this way, a rinsing agent, for example, for steam cleaning, allows complete cleaning of the components even in the gap E.

For moving the parts into the illustrated service position, the correlated drive members G, G', G'' (Fig. 2), not illustrated in greater detail, are designed such that particularly the metering cylinder 6 can be moved into a position above its opening position (Fig. 3, metering device 4.4) in the supply phase provided during the filling process. At the same time, in the service position shown in Fig. 4, the metering

piston 8 is adjustable such that it is located above the mouthpiece 13 without contacting it.

In Figs. 5 and 6, a different embodiment of the metering device 4 is illustrated; it is provided with a mouthpiece 13' that is supported seal tightly in the lower end area of the supply cylinder 16 so as to be axially movable. In this way, the mouthpiece 13' can be moved together with the metering unit that is comprised of the metering piston 8, the metering cylinder 6, and the valve piston 15 from an upper starting position into the illustrated lower dispensing position in an axial direction (movement arrow F). Fig. 5 shows in analogy to the illustration of Fig. 2 (metering device 4.1) the filling phase for the product P wherein the mouthpiece 13' is immersed to an appropriate depth into the cup 5'. Accordingly, the mouthpiece 13' embodied like a movable nozzle is expedient in particular when the product P is to be filled into the cup 5' by a so-called bottom filling action. For this application, a special drive (not illustrated) is provided for the mouthpiece 13' in order to return the mouthpiece 13' into the upper starting position (not illustrated).

In Fig. 6, the valve piston 15 is lowered into the dispensing opening 12' for closing the mouthpiece 13' and, subsequently, a supply cycle can be started in analogy to the functional phase illustrated for the metering device 4.4 in Fig. 3.